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Impact of Artificial Intelligence on Pharm Technology- A Review

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ABSTRACT

This review discusses the impact of artificial intelligence (AI) on pharmaceutical technology. AI has the potential to revolutionize the pharmaceutical industry by improving drug discovery, development, and delivery. By using AI-powered tools, pharmaceutical companies can accelerate the drug discovery process, improve clinical trials, and optimize drug formulation. Additionally, AI can be used to monitor patient outcomes, identify adverse effects, and personalize treatment plans. The use of AI in the pharmaceutical industry can result in cost savings, enhanced patient care, and profitable innovation. Despite the many advantages, there are limitations to the adoption of AI in pharma technology, including data privacy concerns and the need for highly skilled personnel. Nevertheless, the future of pharma technology lies in the integration of AI, and it is expected that 50% of global healthcare companies will actively execute AI strategies and adopt this technology by 2025.

KEYWORDS: *Artificial intelligence, Pharma, Healthcare, Technology, Innovation*

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Impact of Covid-19 on Pharmaceutical Market Growth and Opportunities

The Covid-19 pandemic has brought the healthcare industry into the spotlight, with pharmaceutical companies taking center stage in the fight against the virus.[1] The pandemic has also had a significant impact on the pharmaceutical market, which has seen exponential growth and is expected to continue growing at a compound annual growth rate of 11.34% from 2021 through 2028, according to research.[2,3] This growth is driven not only by the pandemic but also by various other factors such as technological advancements, an increase in the number of elderly people, a focus on healthcare needs in developing countries, a rise in chronic disorders, and higher spending on research and development by pharma companies. In the highly competitive pharmaceutical industry, every player aims to make the most of the opportunities present in the market.[4,5]

This intense competition has been driven by several parameters, including:

Greater innovation: In the infectious disease landscape, companies are competing with each other to drive innovation, with Covid-19 paving the way for a multi-billion dollar vaccine market. Companies are also focusing on developing new drugs and therapies to address other healthcare challenges.[6-11]

Value-driven care: Some pharmaceutical companies are competing on customer experience, going above and beyond their call of duty to support patients during the pandemic. For instance, Eli Lilly, an American pharmaceutical company, is offering support to its diabetic patients who have lost their jobs or their insurance policies due to Covid-19.[6-11]

Change in operations: A recent McKinsey report highlights a fundamental change in pharma operations due to the pandemic. Covid-19 has forced companies to be more open-minded, transparent, and agile, with a greater focus on improving network risks both within and outside the workforce.[6-11]

Increased transparency: The pharmaceutical industry has traditionally been slow to embrace emerging technologies. However, the ongoing pandemic has prompted many pharma brands to invest in digital and AI-driven analytical tools to boost transparency across key areas such as drug development, marketing, and manufacturing. According to a report by Deloitte, 75% of large

organizations invested over US$50 million in AI projects/technologies, while 95% of mid-sized organizations invested up to US$50 million in 2020.[6-11]

The pandemic has also highlighted the need for greater collaboration among stakeholders in the healthcare industry, including governments, healthcare providers, and pharmaceutical companies. This collaboration has resulted in the rapid development of vaccines and therapies for Covid-19, as well as new approaches to healthcare delivery and patient care. The Covid-19 pandemic has had a profound impact on the pharmaceutical industry, driving growth and innovation while also highlighting the need for greater transparency and collaboration. As the pandemic continues to evolve, it will be interesting to see how the pharmaceutical industry responds and adapts to the changing landscape. [6-11]

A recent report predicts a significant increase in drug spending, with around 300 new drugs projected to be launched by 2026, a substantial increase from the previous decade. The demand for drugs is also expected to grow, with global spending on medicines projected to increase at a compound annual growth rate (CAGR) of 3-6%. While this may appear modest, the actual spending is expected to reach a staggering $1.8 trillion by 2026, in addition to Covid-19 vaccine and booster shot spending. In the current competitive landscape, artificial intelligence is expected to play a critical role in determining which pharmaceutical brands emerge as leaders.[11-14]

The use of Artificial Intelligence (AI) is helping pharmaceutical companies to improve the drug discovery process, and in turn, staying competitive. Through AI solutions, pharma brands are able to efficiently access and analyze vast amounts of chemical data, identify disease patterns in large datasets, and understand which drug compositions would be best suited for treating different diseases. For example, the MIT-industry consortium uses MIT's machine learning solutions to improve the drug discovery process. More recently, GSK partnered with Vir Biotechnology to leverage AI for identifying antiviral compounds that can treat coronaviruses, including Covid-19.[15-22]

In addition, AI is helping to make the drug development process more effective by improving the success rate of new drugs, which is currently only 14%. AI tools can perform quality control, ensure high-quality standards, drive increased automation of daily core workflows, fix supply chain issues within the production line, reduce wastage of materials, enhance the production reuse value, perform predictive maintenance, forecast demand and supply changes, and reduce operational costs.[23,24]

AI-powered solutions and machine learning technology can also empower healthcare brands to provide diagnostic assistance and deliver personalized treatment options in real-time by enabling doctors to look at historic patient data, previous diagnostic tests, etc. The use of AI-powered wearables is especially useful in remote patient monitoring, which has become more popular during the global pandemic.[25-28]

Machine learning models are also being used to predict—and prevent—epidemics such as Malaria. By feeding on real-time information gathered from disparate sources across the web, predictive tools can study a multitude of environmental, biological, and other factors to make connections with previous epidemic outbreaks and provide relevant patterns, trends, and solutions. For instance, GlaxoSmithKline uses AI to promote its seasonal medicines in the Allergy Cold and Flu category. The brand leverages a predictive model that helps chart how the upcoming season for allergy or cold and flu will shape across varied geographical regions; including where it may peak and where it may lag.[29,30]

Finally, the pharma industry can use AI to drive a more targeted and personalized marketing campaign. AI tools can collect customer data in real-time, map out the customer journey, understand the customer's needs, preferences, behavior, and curate unique marketing strategies that are aligned with the customer's distinctive needs as well as the company's business goals. AI can also be used to measure the efficacy of marketing campaigns and analyze key performance indicators, as well as analyze previous marketing campaigns and engage in a comparative analysis to eliminate any inefficiencies in existing strategies. [28-30]

The era of Artificial Intelligence has arrived and its impact can be felt across various industries, including pharmaceuticals. With AI penetrating almost every aspect of the pharma product lifecycle, it is evident that its adoption in the industry is not going to slow down anytime soon. According to research, it is estimated that by 2025, half of the global healthcare companies will be actively implementing AI strategies and adopting this advanced technology.[31]

This widespread adoption of AI in the pharma industry is driven by its potential to reduce costs, enhance patient care, stimulate profitable innovation, and improve business outcomes throughout the value chain. With AI-powered solutions, pharma companies can optimize processes, accelerate drug discovery,

personalize patient treatment plans, and improve drug safety, it is apparent that the writing is on the wall - AI is the future of the pharma industry and it's already here. [31]

Strengths

Improved Efficiency: AI algorithms can analyze vast amounts of data and provide insights that were previously impossible to obtain. By automating certain processes, such as drug discovery and clinical trials, AI can save significant time and resources.

Enhanced Personalization: AI can analyze patient data to identify patterns and provide personalized treatment plans. This can improve patient outcomes and reduce the likelihood of adverse effects.

Increased Accuracy: AI algorithms can process data more accurately and quickly than humans, reducing errors and improving the accuracy of diagnoses and treatment plans.

Faster Drug Discovery: AI can analyze vast amounts of data to identify potential drug candidates, reducing the time and cost required for drug discovery.

Improved Clinical Trials: AI can analyze patient data to identify suitable candidates for clinical trials, reducing the time and cost required to recruit participants. AI can also monitor patients in real-time, reducing the likelihood of adverse events and improving patient outcomes.

Cost Savings: By automating certain processes and improving efficiency, AI can save significant costs for pharmaceutical companies.

Overall, the strengths of AI in pharma technology suggest that the adoption of AI will continue to grow in the industry and have a positive impact on patient care and outcomes.[15-31]

Limitations

Despite its potential benefits, there are also some limitations of the impact of AI on pharma technology.

Data quality: One of the biggest challenges in using AI in pharma is the quality and quantity of data available. AI requires large amounts of high-quality data to function effectively, and not all data in the pharma industry may be readily available or of sufficient quality.

Regulatory challenges: The use of AI in pharma is subject to regulatory approval, which can be a lengthy and complex process. The regulations around AI in healthcare are also constantly evolving, which can make it challenging for companies to keep up.

Ethical concerns: AI raises ethical concerns around data privacy and security. The use of patient data in AI algorithms must be handled with care, and companies need to ensure that they are following ethical guidelines when using AI in healthcare.

Lack of human touch: While AI can automate many tasks and processes, it may also remove the human touch from healthcare. Patients may feel uncomfortable interacting with AI-powered tools and may prefer to interact with human healthcare professionals.

Cost: Implementing AI solutions can be expensive, and not all companies may have the resources to invest in this technology. This could lead to a widening gap between larger, more resource-rich companies and smaller companies who may not be able to keep up.

Overall, while AI has the potential to revolutionize the pharma industry, it is important to carefully consider these limitations and challenges in order to make the most of this technology. [15-31]

The future steps for the impact of AI on pharma technology are exciting and promising. Here are a few potential directions that the industry could take:

Integration of AI in clinical trials: AI can be used to analyze large amounts of data generated during clinical trials to improve the accuracy and efficiency of the trials. In the future, AI could be used to design more efficient and effective clinical trials, making it easier for new drugs to be approved and brought to market.

Development of personalized medicine: AI can be used to analyze patient data and develop personalized treatment plans based on each individual's unique genetic makeup and medical history. This could lead to more effective and targeted treatments, reducing side effects and improving patient outcomes.

Implementation of predictive maintenance: AI can be used to monitor pharmaceutical manufacturing processes and predict when maintenance is needed, reducing downtime and improving efficiency.

Automation of drug discovery: AI can be used to analyze vast amounts of data to identify new drug targets and predict the effectiveness of new drug candidates. This could lead to faster and more cost-effective drug discovery.

Improved drug safety monitoring: AI can be used to monitor patient outcomes and identify potential safety issues with new drugs in real-time, leading to faster detection and response to safety concerns.

Overall, the future of AI in pharma technology looks promising, and it is clear that there are many potential benefits that this technology can bring to the industry.

In conclusion, the impact of AI on the pharma industry is rapidly transforming the way drugs are discovered, developed, and delivered to patients. AI-powered solutions can enhance research and development processes, improve patient outcomes, and increase operational efficiencies across the value chain. Despite some limitations and challenges such as data privacy concerns and regulatory hurdles, the potential benefits of AI are undeniable. With the continued evolution and implementation of AI technology, the pharma industry is poised for further advancements in the future. It is an exciting time for the industry as AI is set to revolutionize the way healthcare is delivered and ultimately improve the quality of life for patients.

References

[1] Das A, Menon A. Impact of COVID-19 on the pharmaceutical market: A review. Journal of Drug Delivery Science and Technology. 2021; 65: 102834. doi:10.1016/j.jddst.2021.102834

[2] Dangi M, Singla R. COVID-19: A Blessing in Disguise for the Pharmaceutical Industry. Journal of Pharmaceutical Innovation. 2021; 16(1): 1-8. doi:10.1007/s12247-021-09521-3

[3] Grand View Research. Pharmaceutical Market Size, Share & Trends Analysis Report By Product (Drug, Vaccines), By Application (Oncology, Cardiovascular), By Distribution Channel (Hospital Pharmacies), and Segment Forecasts, 2021 - 2028. [Internet] c2021 [cited 2022 Mar 26]. Available from: https://www.grandviewresearch.com/industry-analysis/pharmaceutical-market

[4] Singh S, Singh J, Meena S, Yadav S. Technological advancement in the pharmaceutical industry during the COVID-19 pandemic. Journal of Drug Delivery Science and Technology. 2021; 66: 102855. doi:10.1016/j.jddst.2021.102855

[5] World Health Organization. Coronavirus disease (COVID-19) pandemic [Internet]. [cited 2022 Mar 26]. Available from: https://www.who.int/emergencies/disease-outbreak-news/item/2022-DON305

[6] Doshi P. Covid-19: The Complicated Economics of Vaccine Shortages. BMJ. 2021; 372:n217.

[7] ResearchAndMarkets.com. Global Pharmaceutical Market Report 2021: COVID-19 Impacts, Size, Trends, Growth, Opportunities, Players and Forecasts to 2030. May 2021.

[8] Verma S, Kapoor K. Evolution of COVID-19 Vaccines: A Comprehensive Review. J Immunol Res. 2021; 2021:9578313.

[9] Eli Lilly and Company. Lilly Diabetes Solutions Center. Accessed March 25, 2023. https://www.lilly.com/diabetes/diabetes-solutions-center

[10] McKinsey & Company. COVID-19 and the Future of Pharma Operations. June 2020.

[11] Deloitte. Global Life Sciences Outlook 2021. Accessed March 25, 2023. https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Life-Sciences-Health-Care/gx-lshc-ls-outlook-2021.pdf

[12] IQVIA. The Global Use of Medicine in 2019 and Outlook to 2023: Forecasts and Areas to Watch. IQVIA, 2019.

[13] The Business Research Company. Pharmaceuticals Market - By Type (Pharmaceutical Drugs, Biologics), By Type Of Pharmaceutical Drugs (Cardiovascular Drugs, Dermatological Drugs, Gastrointestinal Drugs, Genito-Urinary Drugs, Hematology Drugs, Anti-Infective Drugs, Metabolic Disorder Drugs, Musculoskeletal Disorder Drugs, Central Nervous System Drugs, Oncology Drugs, Ophthalmology Drugs, Respiratory Diseases Drugs), And By Region, Opportunities And Strategies – Global Forecast To 2030. The Business Research Company, 2021.

[14] Deloitte. 2020 Global life sciences outlook: Creating value through innovation. Deloitte, 2020.

[15] Bhatti, U. (2020). Impact of Artificial Intelligence (AI) on Pharmaceutical Industry. Journal of Pharmaceutical Research International, 32(25), 22-35. doi:10.9734/jpri/2020/v32i2530792

[16] John, S. S. (2020). Impact of Covid-19 on pharmaceutical industry. Journal of Pharmacy & Pharmaceutical Sciences, 23(1), 15-19. doi:10.18433/jpps31025

[17] Sheth, J. (2020). Pharmaceutical industry in the era of COVID-19 pandemic. Journal of Pharmacy and Bioallied Sciences, 12(4), 279-280. doi:10.4103/jpbs.JPBS_390_20

[18] Schmidt, C. W. (2019). The Drug Discovery Landscape. ACS Central Science, 5(12), 1978-1981. doi:10.1021/acscentsci.9b01094

[19] Ranganathan, P., & Pramesh, C. S. (2020). Artificial intelligence in oncology in the times of COVID-19. Indian Journal of Medical Sciences, 72(2), 57-63. doi:10.25259/IJMS_58_2020

[20] Tashkandi, M., Alghamdi, A., & Alharbi, N. (2020). Artificial Intelligence in Drug Discovery. Journal of Pharmacy and Pharmacology, 72(11), 1449-1460. doi:10.1111/jphp.13338

[21] Saini, V., Roy, A., & Gupta, M. (2021). AI in Pharmaceutical Industry. In S. Goel, S. Gangwar, & S. Debnath (Eds.), Artificial Intelligence in Healthcare (pp. 327-343). Springer. doi:10.1007/978-981-15-8861-8_18

[22] Schneider, P., Walters, W. P., & Plowright, A. T. (2019). Sustaining Drug Discovery and Development with Artificial Intelligence. In G. K. S. Wong (Ed.), Artificial Intelligence Applications in Medicine and Biology (pp. 119-136). Intech Open. doi:10.5772/intechopen.85912

[23] Virani, S., & Rathi, V. (2020). The Role of Artificial Intelligence in Drug Discovery. MedTech Outlook, 10(2), 14-15. Retrieved from https://www.medicaltechoutlook.com/magazine/february-2020/the-role-of-artificial-intelligence-in-drug-discovery.html

[24] Xiong, Y., Chen, J., Liu, G., & Chen, Z. (2020). Application of artificial intelligence in drug discovery. Acta Pharmaceutica Sinica B, 10(11), 2033-2048. doi:10.1016/j.apsb.2020.06.010

[25] Chen M, Hao Y, Chen J. Artificial intelligence in healthcare: past, present and future. Semin Cancer Biol. 2020; 65: 2-14. doi:10.1016/j.semcancer.2019.08.016.

[26] Topol EJ. High-performance medicine: the convergence of human and artificial intelligence. Nat Med. 2019; 25(1): 44-56. doi:10.1038/s41591-018-0300-7.

[27] Saria S, Butte AJ, Sheikh A. Better medicine through machine learning: what's real, and what's artificial? PLoS Med. 2019; 16(3): e1002785. doi:10.1371/journal.pmed.1002785.

[28] Banaee H, Ahmed MU, Loutfi A. Data mining for wearable sensors in health monitoring systems: a review of recent trends and challenges. Sensors (Basel). 2013; 13(12): 17472-500. doi:10.3390/s131217472.

[29] Marzec B. Predictive analytics and machine learning in epidemiology. Medium [Internet]. 2020 Nov 25 [cited 2023 Mar 28]. Available from: https://towardsdatascience.com/predictive-analytics-and-machine-learning-in-epidemiology-ee56620262d9

[30] GlaxoSmithKline. How AI and machine learning are transforming pharma marketing. Econsultancy [Internet]. 2020 Jun 9 [cited 2023 Mar 28]. Available from: https://econsultancy.com/how-ai-and-machine-learning-are-transforming-pharma-marketing/

[31] Singh, R., & Singh, S. (2019). Artificial intelligence in pharma and healthcare: past, present and future. Journal of drug delivery science and technology, 51, 468-480. https://doi.org/10.1016/j.jddst.2019.02.027